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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

ROSASCO, STEPHEN D

ART UNIT PAPER NUMBER

1756

DATE MAILED: 11/03/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/808,063

Applicant(s)

VERNON ET AL.

Examiner

Stephen Rosasco

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 06 October 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) 1-11 and 22 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 12-21 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 3/26/04 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date <u>3/26/04</u> . | 6) <input type="checkbox"/> Other: _____  |

### Detailed Action

Applicant's election without traverse of Group II (claims 12-21) in the reply filed on 10/06/06 is acknowledged.

Claim 12 and 16 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The claim 12 reads "...a plurality of boundaries... at least a plurality of said boundaries...". It is unclear as to the extent of the term "at least" when used with term "plurality". Grammatically it might be more proper but not really clearer to say "at least a plurality of the plurality of boundaries..."

The claim would be clearer if a different term was chosen for the second use of the term "pluralities".

Claim 16 recites "...the phase shift mask comprises a trimless phase shift mask." It is unclear as to what is meant by a mask comprising a mask.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

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Claims 12, 16-19 and 21 are rejected under 35 U.S.C. 102(b) as being anticipated by Flanders et al. (6,534,225).

Flanders et al. teach an alternating phase shift mask with a sloped profile.

Flanders et al. also teach (col. 2, lines 6-10) a method of fabricating an alternating phase shift mask wherein the use of trim masks to remove unwanted printable lines can be eliminated.

Claims 12, 17 and 21 are rejected under 35 U.S.C. 102(b) as being anticipated by Keum (5,300,377).

Keum regarding claim 12, teaches (see claims) a photomask and a method of using for exposure, wherein the photomask includes a non-vertically sloping sidewall phase shift film on a sidewall of each phase shift film.

Claims 12, 17 and 21 are rejected under 35 U.S.C. 102(e) as being anticipated by Nistler et al. (6,780,568).

Regarding claim 1, Nistler et al. teach (see claims) a photomask and a method of using for exposure, wherein the photomask comprises a phase shifting region including sloped sidewalls having, wherein each of the sloped sidewalls terminates in an edge that defines a line patterning feature.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 12-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Keum (5,300,377) or Nistler et al. (6,780,568) or Wheeler et al. (6,228,745) in view of Flanders et al. (6,534,225).

The claimed invention is directed to a phase shift mask comprising features with a plurality of boundaries between adjacent features, said plurality of boundaries comprising a continuous sloped phase edge.

The applicant states that the degree of defocus may be adjusted for individual shot exposures allowing the dose gradient to vary over a large range. For example, the degree of defocus may be adjusted for different figures in the mask. In addition, the defocus may be asymmetric, enabling the dose gradient to be, e.g., steep for vertical edges while gradual for horizontal edges.

Wheeler et al. teach a method of exposure using defocus to form a sloped edge. The defocus may also vary widely and is generally greater than the thickness of the resist, generally up to about +10 $\mu$ m. Also preferred is a positive defocus rather than a negative defocus. The exposure dose may be chosen to be such that the width of the printed line is substantially equal to the width of the corresponding mask pattern. For example, for a 5 times stepper, a 2.0  $\mu$ m mask feature will print a 0.4  $\mu$ m width line. This is conventionally called dose to size and preferably, a dose of about 0.7 to 1.5 times the dose to size is preferred.

The dependent claims recite the following limitations –

The teachings of Keum or Nistler et al. or Wheeler et al. differ from those of the applicant in that the applicant teaches that in claim 13, that a plurality of the boundaries have a continuous sloped edge with a first lateral distance, the first lateral

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distance being approximately on the order of said wavelength; claim 20, wherein a plurality of said boundaries have a lateral distance approximately on the order of the wavelength.

Flanders et al. teach an alternating phase shift mask with a sloped profile.

Flanders et al. also teach (col. 2, lines 6-10) a method of fabricating an alternating phase shift mask wherein the use of trim masks to remove unwanted printable lines can be eliminated.

It would have been obvious to one having ordinary skill in the art to take the teachings of Keum or Nistler et al. or Wheeler et al. and combine them with the teachings of Flanders et al. in order to make the claimed invention because the references teach the formation of sloped profiles and a defocused beam is one that is in focus at a different distance from a substrate which, if done for a certain range would obviously give a sloped profile.

### *Conclusion*

Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Stephen Rosasco whose telephone number is (571) 272-1389. The Examiner can normally be reached Monday-Friday, from 8:00 AM to 4:30 PM. The Examiner's supervisor, Mark Huff, can be reached on (571) 272-1385. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



S. Rosasco  
Primary Examiner  
Art Unit 1756

S. Rosasco  
10/23/06